# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/743,623 | 12/22/2003 | Renato Keshet | 200312649-1 | 7401 |

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| 22879    7590    01/29/2008<br>HEWLETT PACKARD COMPANY<br>P O BOX 272400, 3404 E. HARMONY ROAD<br>INTELLECTUAL PROPERTY ADMINISTRATION<br>FORT COLLINS, CO 80527-2400 | **EXAMINER**<br>WHIPKEY, JASON T |

| ART UNIT | PAPER NUMBER |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on <u>*17 October 2007*</u>.

2a)☐ This action is **FINAL.**        2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle,* 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-38* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,8-11,14,15,17,18,20,21,23,24,27-31 and 33-38* is/are rejected.

7)☒ Claim(s) *6,7,12,13,16,19,22,25,26 and 32* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All  b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

# DETAILED ACTION

## *Response to Arguments*

1.  Applicant's arguments, see page 13, filed October 17, 2007, with respect to claims 37 and 38 have been fully considered and are persuasive. The rejection of claims 37 and 38 under 35 U.S.C. § 101 has been withdrawn.

2.  Applicant's arguments, see page 11, filed October 17, 2007, with respect to the rejection of claims 1-11, 14-18, 20, 21, 23-31, and 33-38 under 35 U.S.C. §§ 102(e), 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new grounds of rejection is made in view of Muresan.

## *Claim Objections*

3.  The amendment to the claims has overcome the claim objections. The claim objections are withdrawn.

## *Claim Rejections - 35 USC § 112*

4.  The amendment to the claims has overcome the rejections under 35 U.S.C. § 112, second paragraph. The rejection of the claims under this section is withdrawn.

### Claim Rejections - 35 USC § 102

5.      The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6.      Claims 1-5, 8, 10, 11, 14, 15, 17, 18, 23, 24, 27-30, and 33-38 are rejected under 35

U.S.C. 102(b) as being anticipated by Muresan (article, "Reconstruction of Color Images from

CCD Arrays", cited on IDS).

Regarding **claims 1, 23, 33, and 37**, Muresan discloses a method of processing a digital

image, each pixel of the digital image having only a single sampled value (in accordance with

the Bayer array shown in Figure 1), the method comprising interpolating values of a first color at

pixels where the first color was not sampled (see page 1, column 2), the interpolation of the first

color value at a given pixel including:

determining likelihoods $(E_i)$ of the given pixel belonging to the same

region as each of at least two other pixels having sampled values of the first color

(using equations 1-3 on page 2), the other pixels in different directions relative to

the given pixel (see Figure 2); and

using the likelihoods and the sampled values of the other pixels to

interpolate the first color at the given pixel (see page 2, column 1).

Regarding **claim 2**, Muresan discloses:

wherein at least two of the directions are orthogonal (Equation 1, for

example, shows that positions 2, 4, 6, and 8 in Figure 2 are used).

Regarding **claim 3**, Muresan discloses:

the directions include north, south, east and west of the given pixel

(Equation 1, for example, shows that positions 2, 4, 6, and 8 in Figure 2 are used).

Regarding **claim 4**, Muresan discloses:

wherein the sampled pixel values are of neighboring pixels nearest the

given pixel (Equation 1, for example, shows that positions 2, 4, 6, and 8 in Figure

2 are used).

Regarding **claims 5, 24, 36, and 38**, Muresan discloses:

further comprising additionally using sampled values of a second color to

compute terms for correcting the sampled values of the first color (equations 2

and 3, for example, show that for the red and blue pixels, green pixels are used in

the calculation).

Regarding **claims 8 and 27**, Muresan discloses:

determining the likelihoods includes applying a similarity function

(Equation 4) to differences between sampled values (see page 2, column 2).

Regarding **claim 10**, Muresan discloses:

the likelihoods are used to compute a weighted average of the sampled

values (see Equation 1, for example).

Regarding **claims 11 and 28**, Muresan discloses:

the first color is green, whereby missing information in a green color plane

is interpolated (see Equation 1 and page 2, column 1).

Regarding **claim 14**, Muresan discloses:

the digital image corresponds to a Bayer CFA (see Figure 1 and page 1,

column 1).

Regarding **claims 15 and 29**, Muresan discloses:

interpolating at least one other color at each pixel (see page 2, column 1).

Regarding **claims 17 and 30**, Muresan discloses interpolating additional missing values,

the interpolation of a second color value at the given pixel including:

using sampled and interpolated first color values (green) to determine

likelihoods of the given pixel belonging to the same region as neighboring pixels

(see Equation 4); and

using the likelihoods and sampled second color values in the

neighborhood to interpolate the second color value (red or blue) at the given pixel

(see equations 2 and 3).

Regarding **claim 18**, Muresan discloses:

computing correction terms ($E_i$); and using the correction terms to correct

the sampled second color values in the neighborhood (see Equation 1).

Regarding **claim 34**, Muresan discloses:

means for acquiring the mosaic image (the Bayer array is inherently used

on an image sensor).

**Claim 35** can be treated like claims 1 and 34.

## *Claim Rejections - 35 USC § 103*

7.      The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

8.      This application currently names joint inventors. In considering patentability of the

claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any

evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c)

and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9.      Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Muresan in view

of Stavely (U.S. Patent Application Publication No. 2004/0240726).

        **Claim 9** can be treated like claim 8. While Muresan determines the likelihoods of a

given pixel belonging to the same region as two other pixels in order to perform demosaicing

(described *supra*), he is silent with regard to including a lookup table.

        Stavely discloses a system that performs demosaicing. As described in paragraphs 41

and 42, demosaicing is performed using coefficients stored in a table in database 224 that

account for the location of the pixel under consideration.

An advantage of looking up such values is that less computation is necessary. For this reason, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have Muresan's system include the lookup table described by Stavely.

10. Claims 20, 21, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Muresan in view of Hel-or (U.S. Patent No. 6,404,918).

**Claims 20 and 31** can be treated like claims 15 and 23, respectively. Muresan is silent with regard to estimating, transforming, smoothing, transforming, and resetting the pixels.

Hel-or discloses an image demosaicing method (see Figure 3), wherein interpolating at least one of the other missing colors includes:

making an initial estimate for the other missing colors (see column 6, lines 30-32);

transforming an output image into a luminance-chrominance color space, the output image including sampled and interpolated values of the fist color, and sampled values of the other colors (see column 6, lines 32-34);

smoothing the luminance and chrominance bands (see column 6, lines 34-38);

transforming the output image back to its original color space (see column 6, lines 38-39); and

resetting measured values and green interpolated values in the output image (see column 6, lines 40-42).

As stated in column 1, line 65, through column 2, line 3, an advantage of performing this procedure is that color artifacts are reduced and resolution around boundaries are improved. For this reason, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have Muresan's system perform the procedure described by Hel-or.

Regarding **claim 21**, Hel-or discloses:

each step is a linear operation, and wherein the steps are performed by applying a concatenation of the linear operations to the output image (see column 6, lines 53-56).

### *Allowable Subject Matter*

11.    Claims 6, 7, 12, 13, 16, 19, 22, 25, 26, and 32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims:

Regarding **claim 6, 7, 25, and 26**, no prior art could be located that teaches or renders obvious a method or apparatus for processing a digital image, wherein each pixel of the image has only a single sampled value, wherein the likelihood of a given pixel belonging to the same region as each of at least two other pixels of a first color is determined, and wherein the likelihood is used to interpolate the first color of the pixel, wherein using sampled values of a second color to correct a sampled value of the first color includes taking a difference between the sampled value at the given pixel and the sampled value of the second color at a neighbor, the neighbor lying in the same direction as the pixel being corrected.

Regarding **claims 12, 13, 19, 22, and 32**, no prior art could be located that teaches or fairly suggests a digital image interpolation method/apparatus with the recited equations.

Regarding **claim 16**, no prior art could be located that teaches or renders obvious a method or apparatus for processing a digital image, wherein each pixel of the image has only a single sampled value, wherein the likelihood of a given pixel belonging to the same region as each of at least two other pixels of a first color is determined, and wherein the likelihood is used to interpolate the first color of the pixel, wherein the likelihoods are used to interpolate missing information in one color plane, and wherein bilinear interpolation is used to interpolate missing information in other color planes, wherein the interpolation includes using sampled and interpolated green pixel values.

### *Conclusion*

12.     This action is non-final because a new ground of rejection is being applied to claims that are substantively unamended.

13.     The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure.

14.     Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Whipkey, whose telephone number is (571) 272-7321. The

examiner can normally be reached Monday through Friday from 9:30 A.M. to 6 P.M. eastern standard time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lin Ye, can be reached at (571) 272-7372. The fax phone number for the organization where this application is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JTW
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January 10, 2008

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SUPERVISORY PATENT EXAMINER